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# Neotropical Monogenoidea. 26. *Annulotrematoides amazonicus*, a new genus and species (Dactylogyridae: Ancyrocephalinae), from the gills of *Psectrogaster rutiloides* (Kner) (Teleostei: Characiformes: Curimatidae) from the Brazilian Amazon

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*Abstract.*—*Annulotrematoides*, a new genus, is proposed to include species with the following characteristics: presence of a longitudinal ventral groove on the posterior trunk; incomplete tegumental annulations; a vaginal aperture on the left margin of the trunk; overlapping gonads; dorsal and ventral anchor-bar complexes; 14 hooks with ancyrocephaline distribution; ventral bar with anteromedial process; and articulated accessory piece and male copulatory organ. The first two characters are unique to the new genus; *Annulotrematoides* is monotypic. *Annulotrematoides amazonicus*, new species, is described from the gills of *Psectrogaster rutiloides* (Kner) from Furo do Catalão near Manaus, Amazonas, Brazil.

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Although phylogenetic analyses are wanting, current evidence suggests that some Monogenoidea from Neotropical fishes have ancient evolutionary links to those of Africa. Gusev (1976a) considered *Jainus* Mizelle, Kritsky & Crane, 1968, from Neotropical Characiformes to be a senior synonym of the Ethiopian *Characidotrema* Paperna & Thurston, 1968, and used this synonymy in part to support a postulated relationship of the two biogeographical faunas. While Kritsky et al. (1987) did not recognize the synonymy, they indicated that the two genera may be sister taxa based on common morphological features of the haptoral armament. Kritsky & Kulo (1992) suggested that a Neotropical-Ethiopian link might also be supported by relationships of species of the Neotropical *Trinigyrus* Hanek, Molnar & Fernando, 1974, the marine *Hamatopeduncularia* Yamaguti, 1953 and *Chauhanellus* Bychowsky & Nagibina, 1969, and the Ethiopian *Schilbetrema* Paperna & Thurston, 1968, all parasites of siluriform fishes. In the present paper a new species of *Annulotrematoides*, new genus, is figured and described from Neotropical Characiformes. This species appears to have an evolutionary relationship with species currently included in *Annulotrema* Paperna & Thurston, 1968, from Ethiopian characiforms.

## Materials and Methods

Hosts, *Psectrogaster rutiloides* (Kner), were collected by seine from the Furo do Catalão (Amazon River System) near Manaus, Amazonas, Brazil (5 January 1989). Methods of parasite collection from the hosts' gills, preparation of the helminths for study, measurement, and numbering of hook pairs are those of Kritsky et al. (1986). Terminology is that of Mizelle & Kritsky (1967) and Kritsky & Mizelle (1968). Measure-

ments, in μm, include the average followed by the range and number (*n*) of structures measured in parentheses. Type specimens are deposited in the helminthological collections of the Instituto Oswaldo Cruz, Rio de Janeiro, Brazil (IOC), the United States National Museum, Beltsville, Maryland (USNPC), the University of Nebraska State Museum, Lincoln, Nebraska (HWML).

Class Monogenoidea Bychowsky, 1937
Order Dactylogyridea Bychowsky, 1937
Dactylogyridae Bychowsky, 1933
Ancyrocephalinae Bychowsky, 1937
*Annulotrematoides,* new genus

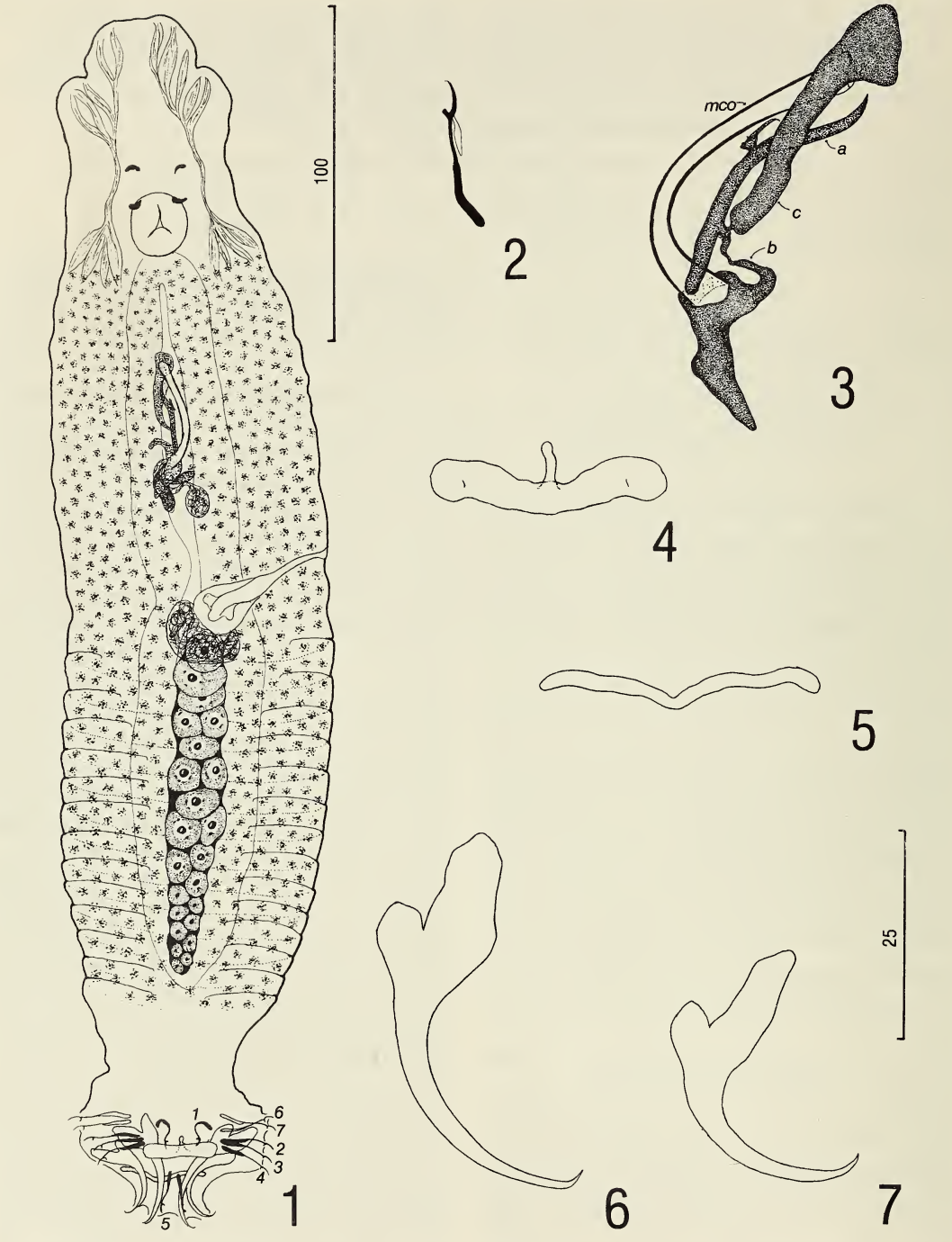
*Diagnosis.*—Body comprising cephalic region, trunk, peduncle, haptor; longitudinal ventral groove between ends of incomplete tegumental annulations on posterior trunk. Tegument thin. Cephalic lobes, head organs, cephalic glands present. Eyes present. Mouth ventral; pharynx muscular, glandular; esophagus short to nonexistent; intestinal ceca 2, confluent posterior to gonads, lacking diverticula. Genital pore midventral. Gonads intercecal, overlapping; testis dorsal to germarium. Seminal vesicle a dilation of vas deferens; 2 prostatic reservoirs; copulatory complex comprising tubular copulatory organ, accessory piece; accessory piece comprising proximal articulation process, distal rod. Oviduct short; uterus delicate; vaginal aperture on left margin of trunk; seminal receptacle a dilation of vaginal duct. Vitellaria present in trunk, absent in regions of reproductive organs. Haptor armed with ventral, dorsal anchor/bar complexes; 14 hooks with ancyrocephaline distribution (Mizelle 1936, see Mizelle & Price 1963). Anchors simple; ventral bar with anteromedial projection; hooks similar, each with erect thumb, shank comprising 2 subunits. Parasites of gills of Neotropical curimatid fishes.

*Type species, host, and locality.*—*Annulotrematoides amazonicus,* new species, from gills of *Psectrogaster rutiloides,* Furo do Catalão, Manaus, Amazonas, Brazil.

*Etymology.*—The generic name reflects similarity of the genus to *Annulotrema.*

*Annulotrematoides amazonicus,*
new species
Figs. 1–7

*Description* (based on 46 specimens).—Body 354 (274–438; $n = 32$) long, fusiform; greatest width 86 (73–117; $n = 33$) usually in posterior trunk or near midlength. Tegumental annulations unscaled, each terminating at margin of longitudinal ventral groove. Cephalic margin broad; 2 indistinct terminal, 2 bilateral cephalic lobes. Eyes 4, equidistant; eye granules subspherical to subovate, variable in size; accessory granules absent. Pharynx spherical, 19 (16–22; $n = 33$) in diameter. Peduncle narrow; haptor subhexagonal, 54 (42–64; $n = 32$) long, 71 (62–85; $n = 31$) wide. Ventral anchor 42 (38–45; $n = 10$) long, with broad well-differentiated roots, evenly curved shaft, point; superficial root longer than deep root; point tip recurved; base width 17 (16–19; $n = 10$). Dorsal anchor 27 (21–30; $n = 10$) long, with elongate superficial root, short broad deep root, curved shaft, recurved point; base width 17 (15–18; $n = 10$). Ventral bar 28 (25–30; $n = 27$) long, platelike, with slightly enlarged ends, elongate anteromedial projection; dorsal bar 31 (28–35; $n = 25$) long, slender, with medial bend. Each hook with erect thumb, delicate point; proximal subunit of shank expanded; hook pr. 1—18 (15–21; $n = 4$); pr. 2—20 (17–23; $n = 4$); pr. 3—21 (19–23; $n = 7$); pr. 4—22 (20–25; $n = 5$); pr. 5—16–17 ($n = 2$); pr. 6—24 (23–26; $n = 4$); pr. 7—23 (22–26; $n = 6$) long; filamentous hooklet (FH) loop extending to just short of union of shank subunits. Male copulatory organ 41 (34–49; $n = 10$) long, an arcuate tube with slightly flared termination; base with elongate variable proximal flange. Rod of accessory piece 30 (26–32; $n = 10$) long, acute terminally, with variable




Figs. 1–7. *Annulotrematoides amazonicus,* new species: 1, Composite drawing of whole mount (ventral view; hook pairs numbered respectively); 2, Hook (of pair 3); 3, Copulatory complex (dorsal view); 4, Ventral bar; 5, Dorsal bar; 6, Ventral anchor; 7, Dorsal anchor. Abbreviations: mco, male copulatory organ; a, distal bar of accessory piece; b, proximal articulation process; c, spatulate arm of accessory piece. All figures are drawn to the 25 $\mu$m scale except Fig. 1 (100 $\mu$m).

flattened projection near midlength; spatulate arm arising from distal end of short articulation process located between base of copulatory organ and rod of accessory piece. Margins of testis undefined; seminal vesicle small; prostatic reservoirs saccate. Germarium elongate, 90 (68–113; $n = 25$) long, 27 (20–35; $n = 23$) wide; ootype not observed; vagina pyriform, with thick proximal wall, opening into large central seminal receptacle.

*Specimens studied.*—Holotype, IOC 33664; 45 paratypes, USNPC 84822, HWML 38340.

*Etymology.*—The specific name reflects the Brazilian state from which the species was collected.

## Discussion

Gusev's (1976a, 1976b, 1978) thesis that the monogenoidean faunas of the Neotropical and Ethiopian biogeographical regions have ancient evolutionary relationships may be supported by the discovery of *Annulotrematoides amazonicus*. This species possesses characters and host preferences suggesting that it may share a common ancestor with species of the African *Annulotrema*. Both genera are characterized by species with tegumental annulations, and while restricted to their respective biogeographical regions, species of *Annulotrema* and *Annulotrematoides* are exclusively parasites of characiform fishes.

With the exception of Paperna's (1979) drawings, description of the internal anatomy has been lacking in studies dealing with *Annulotrema* (see Guégan et al. 1988, Ergens 1988, Paperna 1973). However, Paperna's (1979) depictions of the internal anatomy are not clear regarding the dorsoventral orientation of the internal organs. Examination of four specimens of two unidentified *Annulotrema* species in the collection of the senior author and collected from the gills of *Alestes* cf. *nurse* (Rüppell) in Togo indicated anatomical features that serve to separate *Annulotrematoides* from *Annulotrema*. Although Paperna (1979; 110) states that the vagina opens on the left in all African *Annulotrema* species, three of the above specimens clearly show the vaginal aperture on the right margin (vagina opens on left margin in *Annulotrematoides amazonicus*). The tegumental annulations in *Annulotrema* are complete ventrally, and the gonads are slightly overlapping (testis dorsoposterior to germarium) while in *Annulotrematoides amazonicus* the testis is dorsal to the germarium.

Within the Neotropics, *Annulotrematoides amazonicus* is probably most closely related to the complex of Ancyrocephalinae reported by Boeger & Kritsky (1988) from the gills of the red-breasted piranha, *Pygocentrus nattereri* (Characiformes). Species in the complex comprise *Amphithecium* Boeger & Kritsky, 1988, *Notothecium* Boeger & Kritsky, 1988, and *Notozothecium* Boeger & Kritsky, 1988, and possess comparable internal anatomy, haptoral organization, and structure of the copulatory complex to those of *A. amazonicus*. In addition, some species in all of these genera have an annulated tegument, which is usually scaled in those from piranha. The copulatory complexes in *Annulotrematoides amazonicus* and the piranha's species include a distal rod in the accessory piece, a possible synapomorphy for the four genera.

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